LINKING A DYNAMIC VEGETATION MODEL WITH THE NATIONAL FUELS CHARACTERIZATION SYSTEM

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ABSTRACT

The Joint Fire Science Program is funding the development of a new fuels characterization system for the contiguous United States and Alaska. The new system, based on Fuel Characteristic Classes (FCCs), will provide a broad range of realistic fuel property values at a level of precision commensurate with fuel management decisions. Predicting time-dependent changes in FCCs under alternative fire and fuel management systems will be key to integrating the new fuels characterization system into land use planning processes. State-of-the-art dynamic vegetation models (DVMs) are tools that are well-suited for assessing the longer-term effects of land management strategies on ecosystem viability, including the range of fire regime variability or mechanical treatment alternatives that are consistent with maintaining ecosystem health. Our MAPSS-Century DVM is a process-based model that simulates time-dependent interactions among vegetation structure and composition, biogeochemical processes, and fire. The behavior of a surface fire is simulated in the DVM using Rothermel's fire spread algorithm and a stylized fuel model selected from the standard set of thirteen. The selection of a fuel model is accomplished primarily by reference to the vegetation structure and composition dynamically simulated by the DVM. Fuel loadings estimated from allometric functions of the above ground carbon pools simulated by biogeochemical functions in the DVM can also aid in the selection of the appropriate fuel model. Selecting from the standard set of just thirteen fuel models imposes significant constraints on fire behavior and effects modeling in the DVM. The DVM simulates vegetation structure and composition at greater spatio-temporal resolution than is represented in the set of stylized fuel models. Thus a fuel model selected to represent a simulated vegetation stand rarely matches fuel loadings estimated independently from simulated carbon pools. In addition, the standard fuel models do not include additional fuel classes needed to simulate fire effects and crown fire potential in the DVM (e.g., large woody fuels, forest floor, and crown mass). In contrast to the standard fuel models, the large set of FCCs comprising the new national fuel characterization system will represent the full range of U.S. vegetation cover types, including their physiographic and developmental variants, and will include all the fuel classes required for modeling fire behavior and effects. Linking the new fuels system with our DVM should significantly improve the accuracy of our fire simulations, and will enable us to model transitions over time from one FCC to another. With the full range of fuels represented at a level of precision commensurate with fuel management decisions, the enhanced DVM will be a more effective tool for examining the long-term effects of alternative fuel management on ecosystem viability. In this presentation we will briefly describe the main features of the MAPSS-Century DVM, especially in regard to fire behavior and effects simulation. We will then show an example of a DVM simulation of vegetation and fire severity at the national-scale and over the historical period, paying special attention to the constraints imposed by the use of a limited set of stylized fuel models. Finally, we will outline the steps we are taking to link our DVM with the new national fuels characterization system, and we will discuss the expected utility of the enhanced DVM for integrating fire and fuel management into land use planning processes.